State of Montana
IT Server Optimization "Cobra" Workshop
Full Final Presentation
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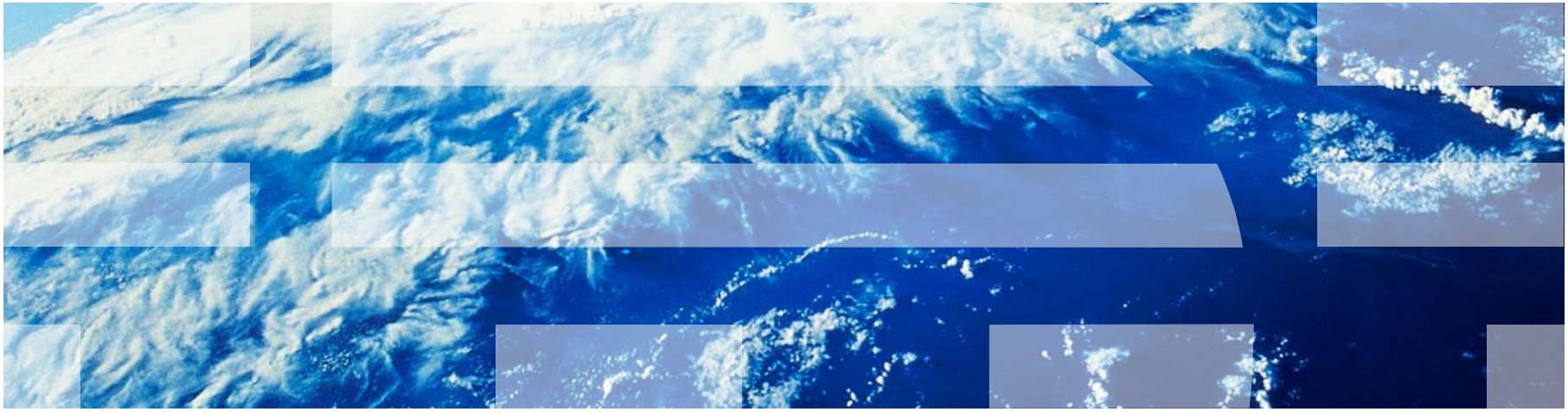

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State of Montana Cobra 0ptimization

State of Montana sponsors

- Tammy LaVigne – Chair, ITMC Virtualization/Consolidation workgroup
- Dick Clark – Chief Information Officer
- Tom Livers – DEQ
- Stuart Fuller - DOA

Objectives

- Develop optimization recommendations that:
  - Improve cost profile
  - Help reduce complexity through infrastructure simplification, consolidation and virtualization
  - Optimize and reduce overall energy and space utilization

Findings

- $14 million potential savings over 5 years
  - Intangible savings
- 77% reduction in server energy consumption
  - NW Energy Incentive Programs
  - 20x10 Agency Incentives
- Timing is Right
  - 58% of server base will be 4 years or older by end of 2010
  - Radical changes in technology create opportunity for capital investments now

Workshop Participants

Agency	Decom	keep as-is	Virtualize
Office of Public Instructions			19
Dep-of-Admin-ITSD	35	73	671
Dep-of-Commerce	8		41
Dep-Env-Quality	6	2	38
Dep-of-Labor & Industry		23	79
Dep-of-Transportation	1	42	107
Dep-of-Fish & Wildlife	3	15	37
Dep-of-Health & Human Services	14	73	80
Dep-of-Revenue	2	34	24
Dep-of-Corrections		27	13
MT-JudiciaryCourts	2	39	15
Dep-of-Natural Resources		13	4
Grand Total	**71**	**341**	**1,128**

- Currently a number of the State's servers have already been optimized to some degree; however, based on input from each agency, there is an additional 298 servers that can immediately be optimized to an even higher level through virtualization and, where appropriate, centralization..

Technical Solution Summary for recommended alternative future state

Summary is based on the lowest cost alternative

	#	Server Island	Current State: Server Type/Model	Current State: Physical Servers	Current State: Cores	Current State: kW	Potential Target State**: Server Type/Model	Potential Target State**: Physical Servers	Potential Target State**: Cores	Potential Target State**: kW
x86	101	x86 - Oracle Databases - Physical to VMWare	x86 (Mixed)	24	135	20	x3850.X5(4)75508C-256GB	3	96	6
	102	x86 - SQL Databases - Physical to VMWare	x86 (Mixed)	20	104	11	x3850.X5(4)75508C-256GB	2	64	3
	103	x86 - Apps/DB/Web/Infra - Physical to Vmware	x86 (Mixed)	178	577	94	x3850.X5(4)75508C-256GB	3	96	16
	104	x86 - Physical to Hyper-V	x86 (Mixed)	23	107	15	x3650.M3(2)5650HC-144GB	2	24	3
	105	x86- Virtual (Refresh 4 yrs or older)	x86 (Mixed)	13	55.6	11	x3850.X5(4)75508C-256GB	1	32	3
Unix	111	Unix- Oracle Databases	Unix (mixed)	20	74.9	20	p.750(16)3.3	3	48	7
	112	Unix- Apps/Web	Unix (mixed)	20	48	13	p.750(16)3.3	2	32	5
				298	1,102	184		16	392	43

Current State:

- Complexity due to server sprawl and high HW diversity
- Some limited potential to improve utilized compute capacity
- Aging Server Environment
- Good virtualization on x86
- Older servers not Energy Efficient
- Lack of economies of scale outside of main DC
- Limited D/R and physical security outside of main DC

Target State Benefits:

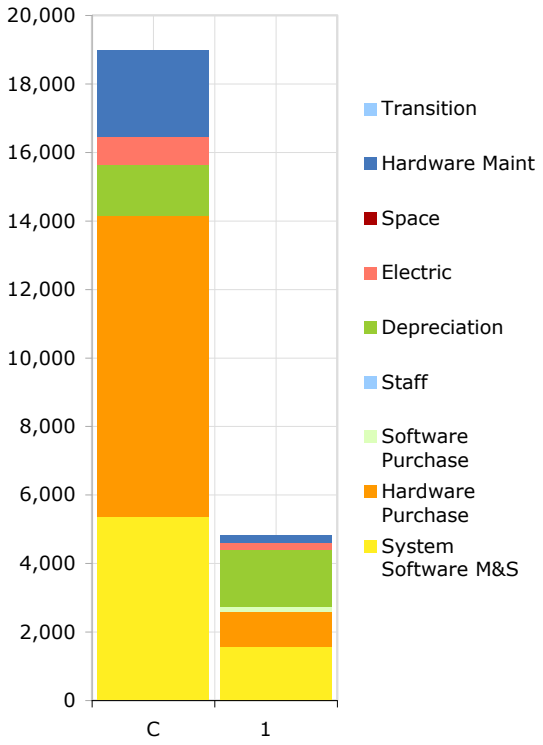
- Highly virtualized server environment
- 95% fewer servers, 65% fewer cores using standard HW and Software building blocks
- Improved utilization of compute capacity
- 77% reduction in server energy* consumption by using energy efficient server technologies.
- ~ $14M in savings over 5 years

Summary business case of all discrete recommendations

Business Case Summary

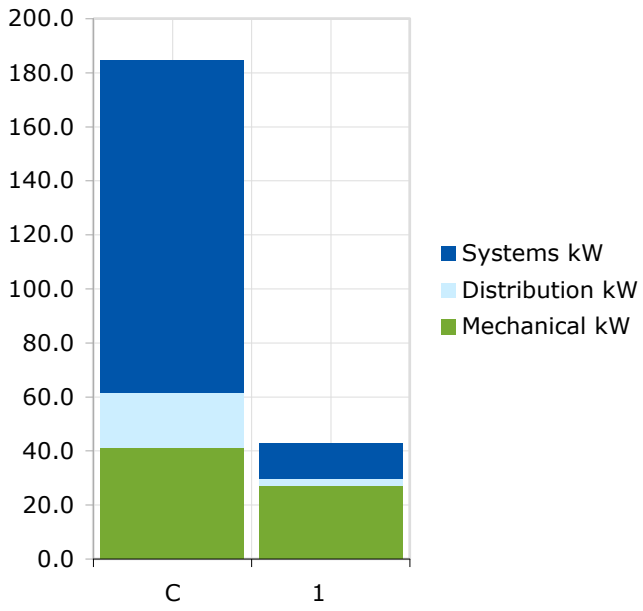
Sizing	Current	AltCase1 115:1	Change
Server Type			
Total CPU Cores	1,101.50	392	-64%
Used CPU Cores	1,101.50	392	-64%
Total CPU Sockets		50	-91%
#Logical Servers	401.00	398	-1%
#Physical Servers	297.90	16.00	-95%
Ave.Log.Srv RIP	2,062.3	1,319.3	-36%
Total RIP Capacity	826,981.7	525,070.0	-37%
Total RIP Workload	125,696.7	125,696.7	0%
Ave %Utilization	19%	22%	15%
Annual Operating Costs (AOC)			
Staff Cost Code			
Software Cost Code			
Software Cost /CPU			
Software Cost /Lsrv			
Software Cost /Psrv			
System Software M&S	1,074,112	315,798	-71%
Hardware Maint	505,478	45,420	-91%
Space	0	0	0%
Electric	161,633	37,448	-77%
Staff	0	0	0%
Depreciation	293,333	333,910	14%
Total AOC	**2,034,556**	**732,576**	**-64%**
est.potential saving /yr		1,301,980	
One Time Costs (OTC)			
Software Purchase	0	153,792	
Hardware Purchase	8,795,750	1,001,730	
	0		
Total OTC	**8,795,750**	**1,155,522**	
	0	0	
Investment incl.Write-Off		-7,640,228	
5 Year Projection			
OTC + 5x AOC	**18,968,530**	**4,756,782**	
5 yr saving		14,211,748	**-75%**

5 Year Projection



Summary environmental case of all discrete recommendations

Environment: Energy/Space	C	1	Change
Total RackU	751.8	96.0	-87%
Racks (38/42U utilised)	19.8	3.2	-84%
Systems kW	**122.9**	**13.2**	
Distribution kW	20.3	2.2	
Mechanical kW	41.2	27.4	
Total kW	**184.4**	**42.7**	-77%
Energy Efficiency			
Relative RIPs /Watt	1.0	9.3	834%
Watts/Workload	20082.3	19169.9	-5%
USD Elec Cost/Log.Srv	403	94	-77%
CO2 Emission			
Systems	592.0	63.4	
Distribution	97.7	10.5	
Mechanical	198.3	131.9	
tonnes CO2 / yr	**887.9**	**205.7**	
tonnes CO2 / kRIP	**7.1**	**1.6**	



High Level –Recommendation

Area	Recommendation
Strategy	▪ Make Optimization a central part of you strategy for your IT infrastructure as a means to reduce costs and improve energy efficiency. ▪ Centralize as much as possible and standardize on one virtualization platform for each major hardware platform (Unix, x86).
Server Optimization	▪ Leverage main DC in Helena for centralizing virtualized workloads. Review performance, availability and security requirements for each agency to ensure adequate service levels. ▪ For x86 workloads virtualize on VMware, leveraging DRS clusters where possible. ▪ For Unix workloads leverage AIX/Linux on Power with micro-partitioning capabilities and Live Partition Mobility as a reasonable alternative to increase reliability and availability.
Technology Refresh	▪ Initiate an immediate technology refresh initiative to replace older equipment. ▪ Where possible retire legacy servers to further reduce power consumption.
Server Platform Selection	▪ For your x86 environment consider 4-socket x3850 X5 or HX5 2-socket blades to leverage technology advancements based on Nehalem and IBM's X5 ▪ For Unix workloads consider virtualizing on AIX/Linux on Power 7 using Advanced Partitioning and Live Partition Mobility
Storage	▪ Review current storage environment to accommodate a virtualized server infrastructure. Refresh older storage gear.
Network	▪ Review network infrastructure for possible reduction of network gear, due to reduction in servers.
Systems Management	▪ Leverage VMware vCenter and IBM Director to manage your new virtual infrastructure. ▪ Consider VMControl to manage virtual server resources on multiple Hypervisors ▪ Leverage an integrated service management system to allow for management of both physical and virtual workloads - through a single interface to physical servers, storage and networking - and to ensure fast provisioning, de-provisioning and remediation of issues.

Next Steps?